Code No: RT32023   **R13**   SET - 1

III B. Tech II Semester Regular/Supplementary Examinations, April -2018
UTILIZATION OF ELECTRICAL ENERGY
(Electrical and Electronics Engineering)

Time: 3 hours   Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**
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PART –A

1	a)	Distinguish between continuous, Intermittent and variable loads.	[4M]
	b)	List the advantages of coreless induction furnaces.	[4M]
	c)	Explain the terms "Pinch effect" and Skin effect".	[4M]
	d)	What is a Glare and how it can be minimized.	[3M]
	e)	Why DC series motor is suited for traction applications. Justify?	[3M]
	f)	Explain the driving mechanics of train movement.	[4M]

PART -B

2	a)	Explain the different types of load torques based on the existing load on an electric drive.	[8M]
	b)	A delta connected 415 V, 50 H.P., 750 rpm. Squirrel cage motor takes a full load current of 55 A and has a full load slip of 4.5 percent. The impedance per phase is 2.5 ohms. Determine the starting torque and the starting current taken from the supply if the motor is started by i) D.O.L. starter; ii) Star – Delta starter; iii) An auto transformer starter with 70 % tapping.	[8M]
3	a)	Distinguish in detail between Direct Resistance heating and Indirect resistance heating.	[8M]
	b)	Explain the working of Ajax Wyatt vertical core furnace with a neat sketch.	[8M]
4		Explain the following terms w.r.t illumination Engineering: i)Reduction factor ii)Utilization factor iii)Maintenance factor iv)Absorption factor	[16M]
5	a)	Explain the construction and working of Sodium vapor lamp.	[8M]
	b)	A minimum illumination of 100 lumens/m^2 is required in the factory shed of 60 m x 15 m. calculate the number, the location and wattage of the units to be used. Assume that the depreciation factor is 0.76, coefficient of utilization is 0.54 and efficiency of the lamp units is 20 lumens/ watt.	[8M]
6	a)	Explain the significance of speed time curves? And give its merits.	[8M]
	b)	A train weighting 200 tonnes is to be driven up an incline of 1.8 percent at a speed of 30 Km/h. If the train resistance at this speed is 1.6 kg per tonne, find the current required at 1400 V dc if the efficiency of the motors and gearing is 88 percent. If the current were cut off, how long would the train take to come to rest?	[8M]
7	a)	Explain and derive the necessary relation for the Total Tractive effort for the propulsion of the train.	[8M]
	b)	How does the value of acceleration and retardation affect the specific energy consumption for a given run at a given schedule speed.	[8M]

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2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**
*****

PART –A

1	a)	List the disadvantages of Group drives.	[3M]
	b)	Distinguish between Core type furnace and Coreless induction furnace.	[4M]
	c)	Explain why very high frequencies should not be used for dielectric heating.	[4M]
	d)	Distinguish between the terms plane angle and solid angle with respect to illumination.	[4M]
	e)	Explain the terms adhesive weight and train resistance.	[4M]
	f)	List the merits and demerits of Electric drive.	[3M]

PART -B

2	a)	State and explain the different factors that affect the selection of a motor for Industrial applications.	[8M]
	b)	A 3 – phase, 415 V, 35 H.P., 600 rpm squirrel cage induction motor has a full load efficiency of 0.80 and power factor of 0.88. The motor takes a short circuit current at 160 A at 0.26 lag power factor. The full load slip is 5%. Determine the minimum starting current drawn from the supply if the starting torque required is at least half the full load torque and it is started by i) auto transformer; ii) a series resistance in the stator circuit. Determine the value of the tapping on the transformer and the magnitude of the resistance to be added to each phase.	[8M]
3	a)	Explain the different methods of Electric heating and give an example of each type.	[8M]
	b)	Explain the basic principle of Induction heating along with the characteristics and its applications in Industry.	[8M]
4		Explain the following terms w.r.t illumination Engineering: i) Candle Power ii) Brightness or luminance iii) illumination iv) Luminous intensity	[16M]
5	a)	Explain the process of measuring M.S.C.P. by integrating sphere.	[8M]
	b)	An incandescent lamp has a filament of 0.05cm diameter and 100 cm length. It is required to make another lamp of similar type to work at double the supply voltage and give half the candle power. Assuming that the new lamp operates at the same brilliancy, determine the suitable dimensions of the filament.	[8M]
6	a)	Explain the following terms: i)Crest speed ii) coasting iii)Schedule speed iv)Average speed	[8M]
	b)	A 750 tonne goods train is to be hauled by a locomotive up a gradient of 3% with an acceleration of 2.0 km/h/s. Coefficient of adhesion is 15 %, track resistance 60N/tone and effecting rotating masses15 % of dead weight. Find the weight of the locomotive and number of axles if the axle load is not to exceed 20 tonnes.	[8M]
7	a)	Explain the significance of Energy star rating for electrical motors	[8M]
	b)	What is Specific energy consumption and list the factors that affect it.	[8M]

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3. Answer any **THREE** Questions from **Part-B**
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PART –A

1	a)	What is an Electric Drive and give its uses.	[3M]
	b)	Distinguish between direct arc furnace and indirect arc furnace.	[4M]
	c)	What are the different types of Lighting schemes?	[4M]
	d)	Compare between Fluorescent tube and filament lamp.	[4M]
	e)	Explain significance of the term coefficient of adhesion.	[3M]
	f)	Distinguish between adhesive weight and total weight of an electric train.	[4M]

PART -B

2 a) Distinguish between a Group drive and Individual drive. [8M]

   b) Derive an expression for temperature rise of an electrical machine. State the assumptions made. [8M]

3 a) Explain the reasons for considering the electric heating as superior compared to other types of heating. [8M]

   b) A three phase arc furnace has to melt 10 tons of steel in 2 hours. Determine the average KW input to the furnace if its overall efficiency is 50%. If the current input is 8000A with the above KW input and the resistance and reactance of the furnace are 0.003 ohm and 0.006 ohm respectively, determine the arc voltage and the total KVA taken from the supply. Assume latent heat of steel as 0.12, latent heat of fusion of steel as 8.89 K Cal/Kg, melting point of steel as 1371 ^{0}C and ambient temperature as 20 ^{0}C. [8M]

4 Explain in detail about the following with respect to Welding: [16M]
   i) Spot welding ii) Seam welding iii) Butt welding iv) projection welding

5 a) State and explain different laws of illumination. [8M]

   b) A lamp with reflector is mounted 13 m above the centre of a circular area of 26 m diameter. If the combination of the lamp and reflector gives a uniform C.P. of 1200 over the circular area, determine the maximum and minimum illumination produced on the area. [8M]

6 a) Compare between D.C. and A.C. systems of railway electrification from the point of view of main line and suburban line railway service. [8M]

   b) An electric train has an average speed of 44 Km/h on a level track between stops 1,200 m apart. It is accelerated at 1.75 Km/h/s and it is braked at 3.2 Km/h/s. Estimate the energy consumption at the axle of the train per tone – km. Take tractive resistance constant at 65 N per tonne and allow 12 % for rotational inertia. [8M]

7 a) Derive the expression for specific energy output from the driving axles using a simplified speed time curve Assume the necessary initial conditions. [10M]

   b) Explain how come energy efficient motors are different from normal motors [6M]

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Time: 3 hours   Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**
*****

PART –A

1	a)	What is meant by load equalization? Explain how this is achieved in electrical industry.	[4M]
	b)	Distinguish between Power frequency method heating and High frequency heating.	[4M]
	c)	Explain the term Mean spherical candle power w.r.t illumination.	[3M]
	d)	A 220 V lamp has a total flux of 1660 lumens and takes a current of 0.44A. Calculate: i) lumens per watt and ii) M.S.C.P. per watt.	[4M]
	e)	What are the different factors that affect the Scheduled speed?	[4M]
	f)	How the train resistance does play its part in the mechanics of train motion?	[3M]

PART -B

2	a)	List the advantages of Electric drive and explain the different categories or classification of Electric drive.	[8M]
	b)	Explain the terms "Heating time constant" and "Cooling time constant" and also explain why cooling time constant is usually greater than heating time constant.	[8M]
3	a)	List the different properties that are required for a good heating material.	[8M]
	b)	A 30 KW single phase, 220 V resistance oven employees circular nichrome wire for its heating element. If the wire temperature is not to exceed 1120^0C and the temperature of the charge is to be 430^0C, calculate the size and length of wire required. Assume e = 0.9 and radiation efficiency K = 0.6. What would be the temperature of wire when the charge is cold (25^0C)?	[8M]
4	a)	Derive the relationship between the plane angle and Solid angle.	[8M]
	b)	A small area of 5 meters in diameter is to be illuminated by a lamp suspended at a height of 4 meters over the centre of area. A lamp having an efficiency of 28 lumens per watt is fitted with a reflector which directs the light output only over the surface to be illuminated. If the utilization coefficient is 0.66 and illumination 850 lux, determine the wattage of the lamp.	[8M]
5	a)	What are polar curves, explain the construction aspect and what do you attain from them.	[8M]
	b)	Explain the working of Fluorescent tube and how the effect of stroboscopic effect can be minimized in this type of lamp.	[8M]
6	a)	List and explain the various requirements of an ideal traction system.	[8M]
	b)	An electric train has a maximum speed of 80 Km/h. The schedule speed including a station stop of 30 seconds is 45 Km/h. If the acceleration is 2.0 Km/h/s, Find the value of retardation when the average distance between stops is 8.6 Km.	[8M]
7		Write short notes on the following : i) Lux meter ii) Energy efficient motors	[16M]

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